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MEMORANDUM TO HOLDERS

NATIONAL INTELLIGENCE ESTIMATE

Soviet Strategic Defenses

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NIE 11-3-71
19 August 1971
[redacted]

Nº 143

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The following intelligence organizations participated in the preparation of the estimate:

The Central Intelligence Agency and the intelligence organizations of the Departments of State and Defense, the AEC, and the NSA.

Concurring:

The Deputy Director of Central Intelligence

The Director of Intelligence and Research, Department of State

The Director, Defense Intelligence Agency

The Director, National Security Agency

The Assistant General Manager, Atomic Energy Commission

Abstaining:

The Assistant to the Director, Federal Bureau of Investigation, the subject being outside of his jurisdiction.

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SOVIET STRATEGIC DEFENSES

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SOVIET STRATEGIC DEFENSES

NOTE

This Memorandum to Holders provides new intelligence on selected areas of the strategic defenses of the USSR which has become available since the issuance of NIE 11-3-71 in February 1971. Emphasis is placed on those sectors of Soviet strategic defenses in which significant developments have occurred, i.e., defense against ballistic missiles and against satellites. Minimal attention is given to the areas of strategic air defense and defense against ballistic missile submarines where developments in the interim have not changed our estimates. No attempt is made to reiterate or explicitly reaffirm all of the major judgments which remain unchanged. We have not included a discussion of future forces for strategic defense because recent developments do not require any significant alterations of our estimates about these forces, or the illustrative force models, as contained in the Estimate.

PRINCIPAL CONCLUSIONS

Defense Against Ballistic Missiles

A. Since NIE 11-3-71 was issued, major new construction has been identified at two of the four previously dormant launch complexes of the Moscow antiballistic missile (ABM) system, and at the site of one of its two large acquisition and target tracking radars. If the construction at the complexes involves emplacement of additional ABM defenses, it is likely that these will employ the improved interceptor missile similar to the Galosh and the new steerable phased-array radar, both of which are under development at the Sary Shagan test center. The result would be a modest expansion of the Moscow system that would both improve its postulated single- and two-layer coverage and reduce its vulnerability to saturation. The new construction at the acquisition and target-tracking radar, at Chekhov, is for additional antennas that will provide coverage of ballistic missiles launched at Moscow from most of China.

B. Construction continues at a high level at a major ABM R&D launch facility (designated Complex F) at Sary Shagan. Testing of a new exoatmospheric, long-range ABM interceptor that is faster than the Galosh has taken place at one of its four sites. A new multiple-aperture radar, rapidly assembled on a hardstand nearby, probably is an engagement radar capable of tracking incoming targets as well as the interceptor missiles. Determination of the precise nature of the activity at the other three sites will require additional construction and the beginning of testing. The implications of the overall activity at this complex are discussed in paragraphs 28 to 30 of the text.

Antisatellite Defense

C. The Soviet program to develop and test an orbital interceptor system has progressed significantly. In addition to the increased pace of intercept testing—two satellite intercept tests were conducted in the first half of 1971, bringing the total to six—we now believe that the scope of the program is much broader than previously estimated. The 1971 tests have demonstrated progress in attaining mission flexibility. They have included the use of a new type of target, differing target orbits, differing orbital maneuvers, and intercept sequences

with the target both behind and in front of the interceptor. Suitable criteria for determining an initial operational capability for a system of this type remain undefined. We believe, however, that satellites which pass over the USSR at any inclination and below altitudes of 1,000 miles could now be vulnerable to this system.

D. In the light of the recent acceleration of orbital intercept testing, we have reviewed the bases of our judgment concerning the likelihood of Soviet interference with US satellites. We still believe it highly unlikely that the Soviets would undertake widespread and continuing destructive attacks against US satellites in peacetime. We rate the chances for selective or sporadic attacks nearly as low. We doubt that the Soviets would launch attacks against US satellites prior to the initiation of hostilities. The repeated demonstration of a non-nuclear antisatellite capability against targets up to about 500 miles, however, gives the Soviets an option on which they can rely should they ever decide to take such action.

DISCUSSION

I. THE SOVIET APPROACH TO STRATEGIC DEFENSE

1. In the short time which has elapsed since NIE 11-3-71 was issued, the Soviets have shown no signs of departing from their traditional approach in making decisions about strategic defenses. Continuing efforts to improve air defenses, new antiballistic missile (ABM) developments, the appearance of modern antisubmarine warfare (ASW) ships, and an accelerated program of satellite intercept testing all attest to an abiding Soviet concern with problems of defense. In some of these areas, recent developments have shed new light on the course of major defensive programs. In no case, however, have they altered the basic conclusions of the Estimate or agency views on matters in which there was disagreement, nor has the new information been such as to change our general level of confidence in these conclusions. We find these conclusions, to be still valid. What follows in this Memorandum is intended to set recent developments into the broader perspective of the major issues developed by NIE 11-3-71.

II. STRATEGIC AIR DEFENSE

2. The Soviets have continued efforts to improve their air defenses through the modification and further deployment of surface-to-air missiles (SAMs), interceptor aircraft, and air defense radars. The trend toward the increasing use of more sophisticated data transmission systems and new reporting techniques by air defense networks continues. These developments are within the bounds of the predictions in the Estimate and have not affected its judgments as to the effectiveness of Soviet air defenses.

3. The more significant developments that have occurred since the publication of NIE 11-3-71 are:

a. Moss aircraft associated with the Soviet Airborne Warning and Control System (AWACS) were deployed to the Black Sea, indicating that AWACS activity may be expanded beyond the present deployment in the Baltic and Barents Sea areas if more aircraft become available. Additionally, recent

Moss activity over the Barents Sea suggests that new modes of controlling interceptors are being used during intercepts within the area of AWACS coverage. The Soviet AWACS may be better able to fulfill its intercept control function than we previously estimated. There is still no evidence of the development of an overland lookdown capability, however, and there are still only nine Moss aircraft.

b. indicate that the Soviets, under favorable acquisition situations, consider targets at an altitude of 50 meters within at least the marginal capabilities of the SA-3 system. . Within the USSR, deployment of the SA-3 is occurring as estimated.

c. Since February 1969, a new radar in association with SA-2 equipment has now been found at about 20 operational sites, where it shares the central guidance area with the Fan Song E radar. The new radar employs a small (9 feet) dish antenna. Its purpose is unknown, but it may be used to provide range data otherwise denied by electronic countermeasures.

d. The Fan Song F radar, used in the newest export version of the SA-2 system, has now been deployed to East Germany and Hungary. Its appearance in other Warsaw Pact countries is likely. Improvements to the radar, which include the addition of an optical tracking device, and to the associated Guideline missile reportedly enable the system to engage targets as low as 300 feet when it is appropriately sited for optimum acquisition. Though previously deployed to North Vietnam and the UAR, this version of the SA-2 system had not previously been seen in East European defenses.

e. Testing of the SA-5 has continued at a steady pace at Sary Shagan a new, additional site is being used for SA-5 test firings. Since none of this test activity can be attributed to investigation of ABM capabilities for the SA-5, our conclusions regarding this system remain unchanged (see paragraph 75, and Conclusion H in NIE 11-3-71).

III. DEFENSE AGAINST BALLISTIC MISSILES

4. Soviet efforts to solve the basic problems of ballistic missile defense continue. Increased research and development (R&D) activity at the Sary Shagan test center indicates a wide range of developments is underway. These include testing of improved interceptor missiles and of new radar designs. Their specific purpose remains largely uncertain. Resumption of construction at some areas of the Moscow defenses long dormant might be for the incorporation of some of the test developments. If this be the case, the Soviets may have overcome basic technical weaknesses in the Moscow system as deployed. In any event, it is clear that as the Soviets begin negotiations on an agreement aimed at limiting ABM deployment, they have a vigorous development program well underway.

A. The Moscow Antiballistic Missile System

5. *Current Status.* The 8 operational ABM launch sites deployed at 4 complexes around Moscow have remained unchanged externally.

A full complement of Galosh missiles (1 for each of the 8 launchers per site) has yet to be seen at any one of the 8 launch sites. The largest number of available Galosh missiles seen at one time was 64 in June 1971. Only 17 of these were at the launch sites, however; the remainder were at the support facility for the Moscow defenses at Borovsk.

6. The key Soviet missile early warning (EW) and ABM acquisition radars (Hen House and Dog House) are not yet in continuous operation, although the frequency and duration of operation have increased. The intercontinental ballistic missile (ICBM) threat corridor to the northwest is now covered on an almost continuous basis, however, by the Hen House EW radar at Olenegorsk. It is not clear whether the combat readiness of the Moscow ABM defenses will be increased in the near future.

Full operational readiness would probably require a minimum of about three hours to achieve, assuming that missiles are available and all equipment is working.

7. *New Construction.* Major new construction was identified in March and April of 1971 at two of the four previously dormant Moscow ABM launch complexes, where work was discontinued in 1964 and 1967, and at the site of the Chekhov ABM radar. The construction activity is in an early stage, indicating it was probably initiated around the beginning of this year.

8. The *two ABM launch complexes* where construction activity is underway are located southeast and southwest of Moscow (see Figure 1, page 7). The other two complexes where work was discontinued remain inactive. None of the new construction activity currently involves the old partially-completed Try Add radar at these complexes. A large excavation and foundations for three buildings can be seen at one of the complexes. The excavation is particularly notable because its dimensions are larger than any seen before in the construction of Soviet ABM facilities. It may be intended to provide hardening for some components by allowing their emplacement underground. The building foundations are located near the abandoned large Try Add building. At the other complex, several large buildings are under construction amid the old Try Add buildings, but no large excavation has been identified.

9.

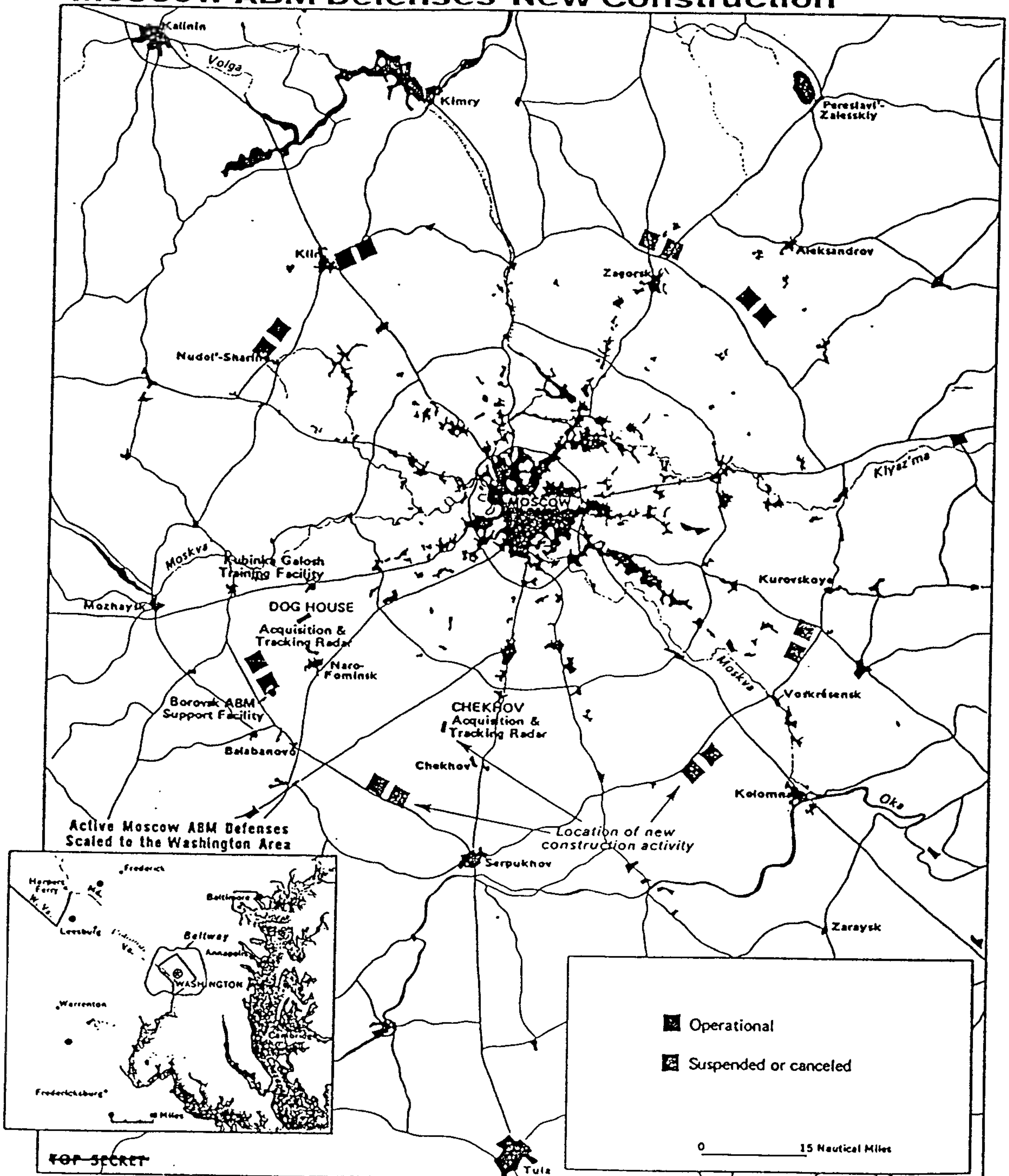
10. Excavations and installation of footings for additional antennas have been identified at both the receiver and transmitter antenna sites of the *Chekhov ABM acquisition and target tracking radar.*

the new antennas will be simliar in size and configuration to those of the original Chekhov radar. Although construction is in an early stage, it appears the new antennas will be oriented to the southeast, in nearly the opposite direction from the original Chekhov antennas.

11. *Significance of the New Construction Activity.* If construction at the two complexes is indeed ABM related, it is likely that the defenses emplaced there will employ a missile similar to the Galosh, but with system improvements. The result would be a modest expansion of the Moscow system with some improvement in both its postulated two-layer and single-

Figure 1

Moscow ABM Defenses-New Construction



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layer defense coverage. This seems a more likely explanation for the activity than deployment of a purely endoatmospheric intercept system. Though the development of an endoatmospheric system may now be underway at Sary Shagan (see paragraphs 29 and 30), and would significantly improve Soviet defenses if deployed at a number of locations around Moscow, it would have to be emplaced at more than just these two complexes to provide significant coverage.

12. The new steerable phased-array target tracking radar under development at Sary Shagan (see paragraph 14) appears to be the best candidate for deployment at these two complexes. This radar appears well suited to acquire and track several targets simultaneously. Currently, there is no Dog House/Chekhov long-range acquisition and tracking radar coverage of submarine-launched ballistic missile launches from regions in the Mediterranean Sea and Arctic Ocean, or of missiles launched from China. Against the threat from these areas, the Soviets would now be forced to rely on the large Try Add target-tracking radar for acquisition as well as tracking. The entire ABM defense might be saturated because of the small number and limited target handling capacity of these mechanically scanned radars. While deployment of one steerable phased array at each of these complexes would reduce the vulnerability of the Moscow defenses to saturation—particularly by missiles from the Mediterranean and China—the defenses would still be exhausted quickly if penetration aids were used and if only 16 launchers were deployed at each operational complex.

13. The new antennas at Chekhov will be oriented in a direction opposite to the original antennas so as to look toward China. [redacted] they could provide excellent coverage of ballistic missiles launched at Moscow from most of China. They could not, however, detect ICBMs launched at Moscow from Manchuria. Additional antennas would be required to provide large acquisition radar coverage of all of China.

B. Antiballistic Missile Research and Development

14. In NIE 11-3-71, we noted that construction was underway in two complexes at Sary Shagan which promised to result in new Soviet ABM developments.[1] At *Launch Complex D,* a follow-on system to the system in the Moscow defenses appears to be under development. The most notable of the developments there is the steerable phased-array radar already noted as a candidate for the new Moscow deployment. This radar probably has a performance capability better than the present Try Add target-tracking radar. Two Galosh-type launchers had been emplaced at this complex at the time the Estimate was issued. [redacted] Although the Soviets apparently intend eventually to construct two additional launchers at Complex D, there has been little evidence of progress in that direction over the past year.

15. *Launch Complex F* was characterized in the Estimate as something of a mystery. Established in an area where the development of advanced air defense systems had taken place, Complex F included Galosh-

[redacted]

type launchers but no large ABM radars comparable to the Try Add or the steerable phased-array radar at Complex D. Other launch sites, as well, appeared to be under construction within the complex. A new type of radar with a phased-array antenna had been quickly erected there. Significant progress has been made at Launch Complex F since February and some of the activities merely noted in the Estimate are now a little better understood. Because of this and because of its potential importance, this Memorandum discusses the developments at Launch Complex F in some detail.

Developments at Launch Complex F, Sary Shagan

16. Construction at Launch Complex F, underway since late 1968, continues at a high level. It now contains 4 distinct areas of activity which appear to be launch sites. (Figure 2, page 10, provides a diagram of this complex which locates activity discussed below.) The nature of the activity has been identified with confidence only at the first site. Determination of the nature of the activity at the other 3 sites and their interrelationships will not be possible until additional construction is completed and testing is initiated. Launch Site 1 contains 2 Galosh-type launchers which have recently been used for the testing of a new exoatmospheric, long-range ABM interceptor.

17. Launch Site 2 has three launch positions containing launchers of a new type. They consist of a launching table mounted between upright supports. They are apparently for vertical launches, and thus represent a distinct departure from the Galosh launchers at Launch Site 1.

suggest that testing of a missile smaller than the Galosh, possibly an endoatmospheric interceptor, is intended.

18. Construction continues in the third area of activity (Launch Site 3) where a dual loop road apparently serves two positions. It is too early to tell whether launchers will be emplaced at these positions or, if so, what they will be like.

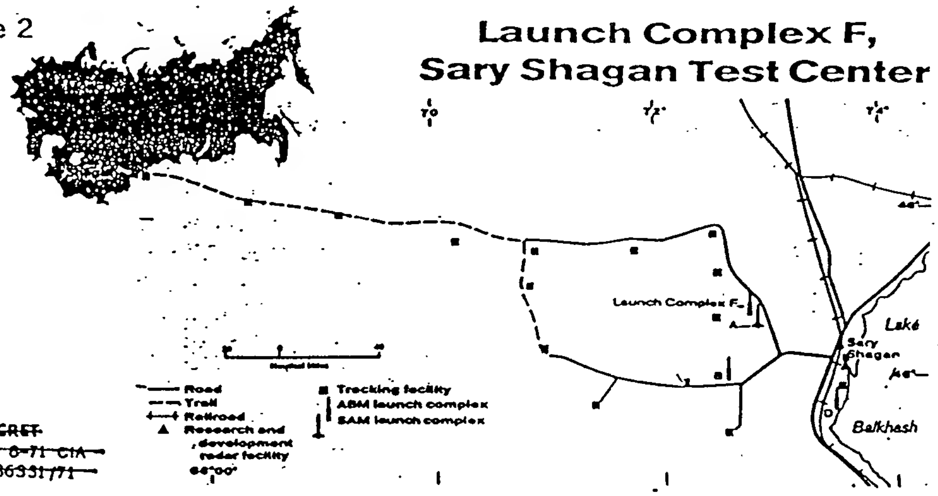
19. Since the issuance of NIE 11-3-71, a new launch area (Launch Site 4) has been identified where work is underway on 6 positions. At one position, construction is underway, possibly of a silo.

Construction at the other 5 positions is distinctly different from that at the silo and closely resembles that at the 3 launch positions at Launch Site 2 suggesting that the same missile will be used at both launch sites.

20. *ABM Interceptor Flight Testing.* The observed characteristics of the six missile flight tests from Launch Site 1 at Complex F since October 1970 indicate that the Soviets are developing a new, two-stage, ABM interceptor. Although faster than the Galosh, it appears likewise designed to perform as a long-range exoatmospheric interceptor.

Figure 2

Launch Complex F, Sary Shagan Test Center



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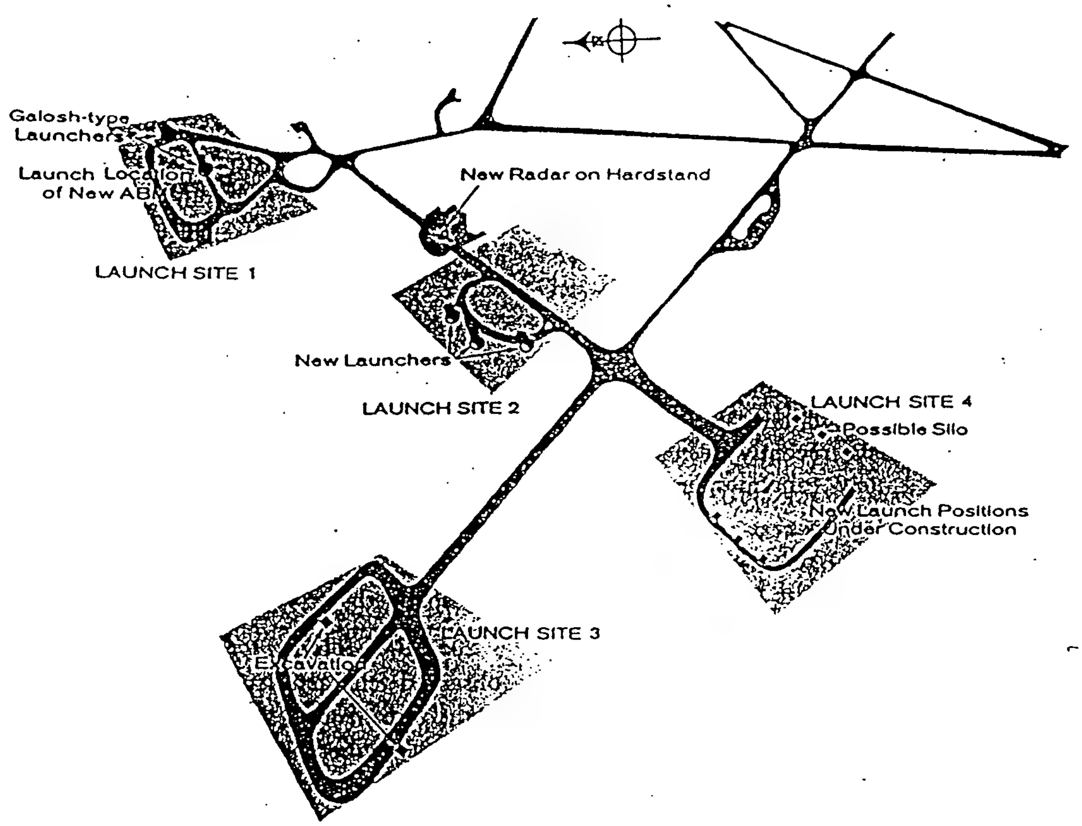

23. *The New Phased-Array Radar.* A radar hardstand is located between Launch Sites 1 and 2.

One of the most notable features of this

radar is the speed with which it apparently can be emplaced.

24. The time from the initial excavation to observation of the radar covered a 17-month period. The deployment of this radar as we see it at the range, however, probably could be accomplished much more rapidly.

25. The radar itself apparently was transported to this location in sections and assembled on the hardstand. We know this was accomplished within, at most, five months and probably much faster. It is possible that the radar could be assembled, calibrated, and made operational within a few weeks or a month. Therefore,

the total construction and radar assembly time perhaps could have been

as short as three months. It must be noted, however, that deployment in the field generally takes longer than construction at the range. Moreover, if the radar we observe at the range is something like a breadboard model containing the components of a radar that will later be packaged as part of a hardened system, the deployment time could be as long as two or three years.

26. The general multiple-aperture appearance of the new radar, and its location near a missile launch site, indicate that it is probably an engagement radar capable of tracking incoming targets as well as the interceptor missiles. Though the radar in some respects resembles Soviet SAM radars, it is probably intended for ABM use. It is much larger in size and the amount of supporting equipment associated with it favor this judgment as does the ABM flavor of Complex F as a whole. Nevertheless, the possibility that the radar may have some SAM role—possibly in addition to an ABM function—cannot now be ruled out.

27. Several postulations as to the use of the various apertures of the radar are possible, but generally they include the use of the planar array as a target tracker. The following estimates of its capability are based upon this assumption, among others:

a. If radar powers are assumed that are consistent with the support equipment seen and with the technology of proposed US mobile ABM systems, we conclude that the radar as observed at the range probably would not be able to detect US ICBM re-entry vehicles (RVs) much beyond

the radar appears best suited for relatively short-range operation. Any deployment would probably be in areas already enjoying long-range Dog House, or possibly Hen House, radar coverage.

b. The range calculation leading to this conclusion is based largely on the fact that, as observed, the radar is dependent upon associated electronic vans. If the radar were repackaged so as to use permanently installed power generating equipment, higher power and greater detection ranges might be achieved

Even in this case, however, the radar would still require a Dog House-type long-range target tracker to accomplish long-range exoatmospheric intercepts. This requirement would not exist if the radar were used with a short-range interceptor. Such may be the case—it is not yet clear how many different missiles will be developed at Launch Complex F or what their characteristics will be. As noted above, it appears that the missile currently being tested at Lauch Site 1 is a long-range exoatmospheric interceptor. Other launch sites have not yet been used, however, and other types of interceptors may appear.

28. *Implications of the Complex F Activity.* Any assessment of the activity at Complex F depends heavily upon whether or not all of the activity we observe there is related to a single program. In NIE 11-3-71 we made the tentative judgment that this was apparently so. Our judgment on this question has not changed, but the possibility remains that separate programs are involved.

29. If only a *single program* is underway, two reasonable explanations for the activity can be postulated. An ABM system utilizing two interceptors may be under development involving both exo- and endo-atmospheric interceptors to be used with the new radars

observed at Launch Complex F. This explanation was provided in the Estimate. It is also possible, however, that the missile under test at Launch Site 1 is the only missile involved and that the various launchers seen at Complex F are steps toward the development of a silo launch capability with a Galosh-like missile. An effort to harden some of the system components might also be a part of such a program.

30. If *more than a single program* is being conducted at Launch Complex F, another possibility emerges. The interceptor undergoing testing at Site 1 could be intended for use with the steerable phased-array radar at Launch Complex D. Several considerations argue in favor of this. An exoatmospheric interceptor would be consistent with the large radars at Complex D. The existence of Galosh-type launchers and canisters in both areas suggest the use of a common missile. If the association between Launch Site 1 and the activity at Launch Complex D is correct, then the activity at Site 1 may not be related to any of the other sites at Complex F. These other sites may be related to the development of an endoatmospheric system utilizing a new terminal intercept missile. This would be consistent with the new radar and launchers at Site 2. The other two sites (Sites 3 and 4) could be used to test different launch techniques for the new endoatmospheric interceptor.

IV. DEFENSE AGAINST BALLISTIC MISSILE SUBMARINES

31. Improvements in Soviet ASW capabilities are represented by the operational deployment of the Krivak-class destroyer. Other developments worthy of note that have occurred since publication of NIE 11-3-71 are:

a.

b. There is stronger evidence now that the buoys moored by the Soviets in the Straits of Sicily are hydroacoustic. Two large hydroacoustic buoys recently recovered from the Norwegian Sea may be similar to those in the Straits. Though this cannot be conclusively established, a number of considerations argue that it is so.

The observed pattern of arrays and clusters in the Straits of Sicily suggests that these buoys may form a surveillance system capable of providing position and track information during the passage of the Straits as well as merely obtaining a count of submarines passing through the area. The presence of surface support ships appears currently to be necessary for operation of the system:

c. The airdropped sonobuoy used by the May aircraft is now known to be a passive, omnidirectional buoy. When sown in quantity from an aircraft, however, these buoys transmit sufficient data to the aircraft for the automatic calculation of a submarine's course and speed. We believe this buoy system is now operational. The utility of this system against Polaris submarines in the open ocean is doubtful, however, as the initial detection and localization of submarines remain serious Soviet deficiencies.

d. The increased frequency of flights of Bear ASW aircraft—in particular the flights to the North Atlantic in late July—indicate that this aircraft is at least available for service, if not already in limited operational use.

strongly suggest that the ASW system employed aboard the aircraft is similar to that of the May aircraft. It probably employs the same new sonobuoy and on-board computers. More Bear ASW aircraft are now operational than when NIE 11-3-71 was issued (5 compared to 3 earlier). Therefore, the ASW Bear may be in limited production.

V. ANTISATELLITE DEFENSE

32. For a number of years the problem of assessing Soviet antisatellite capabilities was one of investigating the suitability of various system components for use in detecting, tracking, or intercepting satellites. No clearly defined antisatellite program could be found. Nevertheless, the Soviets were found to possess the components necessary for antisatellite defense and it was concluded that they had the capability to interfere with US satellites. In the past few years, we further noted that this could be done without resort to nuclear weapons. Among the developments which gave the Soviets this capability were their large space surveillance radars, ABM facilities at Sary Shagan and Moscow, ballistic missiles of various types, and several different types of maneuverable satellites.

33. Now the situation has changed. Once in 1968, and three times in the last year, the Soviets have tested the ability of their maneuverable satellites to intercept a target in orbit.

Though the use of the Moscow ABM system would seem to us to have distinct advantages against satellites in low earth orbit, insofar as we can tell the Soviets have not as yet tested it in such a role. Neither have they investigated the possibilities of employing ballistic missiles for antisatellite defense as the US chose to do.

34. The Soviet solution to this problem seems to rest upon the use of maneuverable satellites. Because of this, the Soviet orbital intercept program is discussed in far greater detail in this Memorandum than in any other estimate. We have also reassessed our earlier judgments as to the likelihood of Soviet interference in light of recent orbital interceptor testing.

A. The Orbital Intercept Test Program [2]

35. The USSR's program to develop and test an orbital interceptor system has progressed significantly since the issuance of NIE 11-3-71. Two additional satellite intercept tests were conducted in the first half of 1971, bringing the total to six. In addition to the increased pace of intercept testing, we now be-

[2] See the Annex for a detailed discussion of this program.

lieve the scope of the program is much broader than previously estimated.

— It now appears that six heavy maneuverable satellites which have been tested since 1967 may be a part of an interceptor program involving the development of components or techniques to be used by the final system.

— In addition, it seems likely that some SL-7 launched satellites may have been used to check out and calibrate ground-based monitoring sites. Two instrumentation sites (probably exclusively devoted to the program) have been identified in the western USSR.

— The two interceptor tests this year have used lighter, and presumably smaller, targets launched by the SL-8 from Plesetsk, while the previous targets were launched from Tyuratam by the SL-11.

— A new spacecraft checkout building under construction at the SL-11 launch area at Tyuratam, appears suitable for assembly and checkout of a number of payloads simultaneously, and is thought to be associated with this program.

36. The 1971 intercept tests have demonstrated progress in attaining mission flexibility. They have included the use of a new type of target, differing target orbits, plane changes by the interceptor to accommodate the target's orbit, differing orbital maneuvers to achieve the geometry for encounter, and intercept sequences with the target both behind and in front of the interceptor. Every successful encounter occurred on the interceptor's second orbit, over the area of the Soviet-Polish border. This fact, together with the identification of two associated monitoring sites in the area leads us to believe that the intercept tests have been staged to take place over that portion of the USSR. We do not believe, however, that operational use of an interceptor would necessarily require encounter on the second orbit, or over that area of the world.

37. During recent tests, we have observed a new search and acquisition sequence during the interceptor's homing phase, and changes in the weight of the interceptor. It is believed that this new search mode enables the detection of the target in a larger volume of space. We do not know what type of sensor is used by the tracking system the interceptor employs. The most likely one is a radar as opposed to an optical or long-wave infrared device.

38. We are unable to determine whether or not a warhead is carried by the interceptor and used in an attempt to destroy the target.

— The presence of a warhead is suggested by the fact that the interceptor has been observed, in most cases, in fragments in the orbits following the intercept. If a warhead were used in the tests, however, destruction or disablement of the target would be the appropriate measure of success. In the six tests to date, target destruction occurred only once, though disablement may have occurred on a second occasion. This would seem a rather low success rate in view of the apparent progress of the test program.

— On the other hand, it is as possible that the spacecraft involved are simply be-

ing destroyed by on-board charges at test completion and that no warhead is carried. [redacted] If no warhead were carried, survival of the target after encounter could not be considered an indication of test failure. Since the guidance scheme apparently used by the interceptor would permit very small miss distances, an appropriate warhead is well within Soviet reach. We must then assume that so long as the target was acquired and the maneuver engines performed properly, the test was successful. On this basis, four of the six tests were successful.

39. There may be a number of limitations which would affect the operational use of the current interceptor system. These include problems created by the need to counter satellites in orbits with inclinations not heretofore used by the Soviets. The Soviets, for example, have always employed posigrade orbits while many US reconnaissance satellites use retrograde orbits.[8] In such circumstances, new considerations emerge as to the launch azimuth, impact locations of the first stage, monitoring of orbital insertion, and command and control of the interceptor once in orbit. We do not believe, however, that the launch azimuth from Tyuratam for an SL-11 employed operationally would be a dominating consideration. The energy requirements for a retrograde launch into a near earth orbit—if they exceeded the capability of the launch vehicle—could be met by using the payload's maneuver engine with some attendant reduction in orbital maneuver capability. Although the impact of the first stage certainly is a consideration, it should be possible to avoid endangering built-up areas and we doubt that this consideration would be so important as to preclude use of the interceptor. Further, we believe that monitoring of orbital insertion could probably be done adequately, in most cases, from rangehead facilities without downrange instrumentation sites.

40. Requirements for ground-based command and control of the interceptor in orbit could limit seriously the interceptor's operational use. [redacted] It is possible that the operation of an interceptor could be mostly preprogrammed, with little, if any, updating by ground sites required, so long as the orbit of the target satellite is well established prior to interceptor launch and no evasive action is taken.

41. Although our understanding of this program has increased in the past several months, its rationale is still not understood. The choice of an orbital system by the Soviets for use against low-altitude targets such as reconnaissance satellites—which one might presume are provocative enough to evoke Soviet reaction—is puzzling. The use of the Galosh ABM interceptor appropriately equipped with a nonnuclear warhead, and possibly with a homing system, would appear to provide a more attractive antisatellite system for use against targets such as these. Such a system would provide fast reaction, little susceptibility to target countermeasures, and a far better chance for clandestine use than would an orbital system.

42. It may well be that the mission of the system under development is not limited to attacks on reconnaissance satellites. It may represent rather a major defensive system of

[8] A posigrade orbit is one in which the satellite is moving in the direction of the earth's rotation. When the satellite moves in the opposite direction to the rotation of the earth, it is in a retrograde orbit.

greater scope, suitable for rapid deployment in space to cope with a military orbital threat not as yet specifically defined. Other Soviet defensive developments, such as the southeast face of the Dog House radar or the high-altitude SA-5 system, have been undertaken and completed in response to anticipated threats which had not yet become operational.

43. A broader view of the orbital interceptor program shows that it encompasses a large number of launches which have taken place at least since 1967, and possibly even earlier. As can be seen from Table I, page 24, the pace of the program has been steadier and more measured than would appear to be the case if only the intercept tests themselves were considered. It may be that the actual intercept tests and the "heavy" maneuverable satellites represent two phases in the development of a single system. If so, the operational interceptor may combine the terminal functions of the interceptor currently under test with the longer orbital lifetime of the heavy maneuverable vehicles.

44. The development of facilities and techniques suggestive of an intent to launch a number of satellites quickly argues that many satellites could be maintained in readiness for days, either on the ground or in orbit, in a period of crisis without a final decision being made to destroy their targets. Though such an interpretation of observed events as the development of a more general orbital defensive system can only be based upon conjecture, it does provide an alternative view of the Soviet orbital interceptor test program which is in many regards more understandable than its interpretation as a system intended only to attack US reconnaissance satellites. In any event, it is necessary at this time to consider all possible uses of the orbital anti-satellite capability the Soviets have created.

45. Suitable criteria for determining an IOC for a system of this type remain undefined. Furthermore, we are unable to establish firmly the operational sequence in which US satellites would be engaged. We believe, however, that satellites which pass over the USSR at any inclination and below altitudes of about 1,000 n.m. could now be vulnerable to this system.

46. In order to use the interceptor at altitudes much greater than about 1,000 n.m., a new launch vehicle would be required. Beyond the near earth region, synchronous altitudes (19,300 n.m.)—used extensively by US military support satellites—are likely to be of greatest interest to the Soviets. The only operational Soviet space launch system that could place the demonstrated interceptor into the geostationary orbit region is the SL-12. Cosmos 382 was an engineering test of the SL-12 fourth stage to perform maneuvers over several days, including a 15 degree plane change. One of the purposes of this test may have been to check out propulsion and guidance equipment used in a way similar to that needed for delivering a payload to the geostationary corridor; i.e., roughly in the plane of the equator at synchronous altitude. Thus, it is likely that the Soviets could place an orbiting interceptor with non-nuclear kill at that altitude, should they decide to make the effort. The existing interceptor could carry out an engagement once delivered to the geostationary corridor. Our earlier comments about unrecognized operational difficulties that may hamper operational use of the orbital interceptor based on the SL-11 apply with equal, if not greater, force in this case.

B. Likelihood of Soviet Interference with United States Satellites

47. We have reviewed the bases for our judgment concerning the likelihood of Soviet interference with US satellites in the light of

the recent acceleration of Soviet orbital intercept testing and the repeated demonstration of a non-nuclear antisatellite capability. We find that there continue to be compelling reasons for believing the Soviets will be deterred from taking destructive action against US satellites in peacetime. (See SNIE 11-12-70, "Likelihood of Interference with US Reconnaissance Satellites", dated 14 July 1970, TOP SECRET, ALL SOURCE, for a fuller discussion of these reasons.) The Soviets would have to consider the extremely provocative nature of such action. A deterrent would be the fear of US retaliation against Soviet satellites. The Soviets are deeply committed to their own reconnaissance satellite program, and their dependence on the information it provides is unlikely to diminish. The US probably remains a primary target, and we believe that the share of the effort directed against other areas, particularly China and Europe, has increased.

48. Apart from their interest in protecting this important source of intelligence, the Soviets probably see other reasons for maintaining the status quo. Acceptance of satellite reconnaissance by both sides had come to be considered an essential element in the present situation of mutual deterrence. The Soviets probably reason that US detection of any interference on their part would be seen by the US as an attempt to destabilize the situation, particularly if the interference occurred after a SALT agreement. In the course of the SALT negotiations the Soviets have indicated a readiness to undertake a commitment not to interfere with reconnaissance satellites. Indeed, they appear to have learned to live with satellite reconnaissance. [

]

49. Furthermore, there appear to be other explanations for the Soviet orbital intercept program than an intent to take action against US satellites in peacetime. As noted above, the program has been underway for many years and, despite the recent accelerated testing, shows a steady pace toward an objective probably established in the early 1960s. This objective may well include countering reconnaissance satellites but could also involve action against the broad range of space weapons—orbital bombs, satellite interceptors, even manned systems—that were so widely discussed in this period. Soviet writings reveal concern about such possibilities. If the creation of spaceborne defenses against threats such as these is the intent of the orbital intercept program, recent activities can better be explained as a technological phase in a long-range test program rather than as an urgent preparation for an attack on US satellites.

50. The repeated demonstration of a non-nuclear orbital intercept capability against targets up to about 500 miles would, to be sure, give the Soviets an option on which they could rely should they ever decide to take action against US satellites. The Soviets probably would see fewer restraints on the use of a non-nuclear system, particularly if they were to estimate that the US would have to use a system employing nuclear weapons in retaliation. In a non-nuclear wartime situation, the employment by the Soviets of a system with a conventional warhead would not necessarily carry with it the risk of escalation inherent in the use of a nuclear armed system.

51. Despite these considerations, our judgment remains essentially unchanged. We still believe it highly unlikely that the Soviets would undertake widespread and continuing

destructive attacks on US satellites in peacetime. We rate the chances for selective or sporadic attacks nearly as low. We doubt that the Soviets would launch attacks against US satellites prior to the initiation of hostilities. They would probably judge that in a period of heightened tension that would precede a US-Soviet conflict, the US would assess the Soviet action as part of a general attack. We further believe that the considerations mentioned in paragraphs 47 and 48, which presently militate against Soviet interference with US satellites, are likely to become even more compelling over the next several years.

ANNEX

THE SOVIET ORBITAL INTERCEPT TEST PROGRAM

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THE SOVIET ORBITAL INTERCEPT TEST PROGRAM

1. The USSR has conducted orbital satellite intercept tests since late 1968. The origins of the program may go back as far as late 1963, however, when the Soviets launched the first of four maneuverable spacecraft, which conducted a variety of engine tests. The first two of these early test vehicles were placed into orbit by the SS-6 ICBM booster, and the second pair by an SS-6 with an extra upper stage. Whether or not these early tests were directly related to the subsequent intercept test program cannot be established with certainty, though there are similarities between these early maneuverable satellites and the later ones.

2. The current program, involving the use of the SL-11 launch vehicle (the SS-9 ICBM) began in late October 1967. Eighteen launches using the SL-11 have been made in this program. Sixteen of these have successfully orbited their payloads. In addition to the SL-11, two other launch vehicles are being used. The targets for the last two satellite intercept tests (Cosmos 394 and Cosmos 400) were launched by the SL-8 (the SS-5 IRBM with a modified second stage). The SL-7 (the SS-4 MRBM with an upper stage) was used to launch satellites for what appears to be the checkout and calibration of ground sites which later support the intercept tests. Three of these satellites have been associated with the maneuverable satellite program. A summary of the test program is presented in Table I, page 24. A more detailed description of the tests and the achievements of the program ~~is~~ provided in later paragraphs.

3. The orbital intercept program is supported by several bases on the ground. A launch area at the Tyuratam test center serves only the SL-11 launch vehicle, and all spacecraft boosted by it. Though the SL-11 is essentially the SS-9 ICBM, launch silos could not be used to launch the interceptors because of their large size. A launch area at the Plesetsk missile and space center probably is used to launch the SL-8 carrying target vehicles and the SL-7 carrying payloads to check out and calibrate ground monitoring sites. In addition, two large space tracking sites in the western USSR monitor the end phase of each test and probably some of the manuevers made by satellites. These sites have unique signal tracking devices, beacon tracking radars, and equipment for receiving telemetry. Other tracking sites also monitor and command spacecraft launched by the SL-11.

4. The 18 spacecraft launched by the SL-11 comprise two groups, differentiated by their weight. The heavier spacecraft weigh about 9,500 pounds. Because they are heavy, they require the use of the engine on the space-

craft itself (in addition to the launch vehicle) in order to get into orbit. Four of six launches of the heavier vehicles have been successful. They perform maneuvers with an engine similar to one used by the lighter satellite interceptors.

these satellites are a part of the overall orbital interceptor test program. The purpose of these "heavy" satellites, however, is not clear. They have been launched sporadically. Based on their demonstrated activity, the use of these satellites appears to be for tests of the spacecraft's ability to perform precise changes in orbit. They may have had additional unidentified test objectives.

5. The second group consists of 12 lighter satellites. Six of these spacecraft were employed as interceptors in the tests, two were targets, and four were used in early developmental flights.

6. The pace of interceptor testing has increased significantly during the past nine months. The first test series, involving two interceptors and a target, was conducted in late 1968. A similar series was conducted exactly two years later, in late 1970. The next intercept test was conducted about four

months later, and the most recent one only five weeks after that, in early April 1971.

7. Several factors indicate that this program has a fair degree of importance to the USSR:

— the number of spacecraft and tests involved;

— the period of time over which these events have occurred;

— the timing of the tests relative to each other;

— and the number and nature of supporting ground installations.

Other indications of continuing development such as the recent observation of four payload transporters at the Tyuratam launch area, and the construction of a large new payload-associated building nearby, indicate that the program is being pursued vigorously.

8. As part of this effort, the Soviets have developed a capability to rapidly load propellants aboard the SL-11 launch vehicle.

It indicates a requirement to provide the system with a quick reaction capability.

9. We cannot determine with confidence whether or not the interceptors used in this program are equipped with a warhead. A number of features of the tests suggest that some type of warhead was fired at four of the six targets. It is possible that the breaking up of the interceptor, observed in three instances, was caused by use of a warhead. Simply blowing up the interceptor itself, however, might be a sufficient damage mechanism in light of the ability of the interceptor to maneuver close to its target.

Engineering Flight Tests

10. Between November 1963 and July 1966, four spacecraft conducted a series of tests of propulsion systems for control of the spacecraft's attitude and for orbit adjustments. The booster was the SS-6. The first two spacecraft, designated by the Soviets as Polet 1 and 2, had a short lifetime, completing all maneuvers within a few hours of launch. The other two vehicles, Cosmos 102 and 125, had longer lifetimes, performing maneuvers after as much as a day in orbit. The tests of the propulsion system, engine placement, attitude control systems, and type of orbital adjustments are similar in some respects to vehicles launched later by the SL-11.

11. Between October 1967 and April 1968, four more spacecraft conducted additional tests of attitude control and propulsion systems. These vehicles were launched by the SL-11 and directly preceded the first actual intercept tests in late 1968.

all con-

ducted a characteristic sequence of maneuvers. These features, together with similar characteristics of spacecraft involved later in the program, suggest that this group included launch vehicle and payload flights directly associated with the later orbital intercept tests.

12. Five additional engineering flight tests followed the first intercept test series in late 1968. In two of these the satellites did not achieve orbit. The three vehicles which did orbit performed engine tests and maneuvers. They are therefore believed to represent additional launch vehicle and payload flights.

13. In 1971 the most recent launch of another heavy satellite occurred. In addition to performing additional engineering tests, it exhibited several characteristics of an interceptor during its flight

The Cosmos 248, 249, and 252 Test Series—October 1968

14. The first intercept test series took place in October 1968. (Table II, page 27, summarizes all of the intercept tests to date.) The target, Cosmos 248, was launched by the SL-11 on 19 October. It had been preceded one month earlier by a calibration satellite. After achieving orbit, the target made two changes in its orbit which resulted in a final, near-circular, orbit (at 285 miles altitude, and on a 62 degree inclination) which made it pass nearly over Tyuratam each day—a situation favorable for the launch of an interceptor. This orbit suggests that the conditions for the test were carefully chosen.

15. The first of two interceptors, Cosmos 249, was launched one day after the target (Cosmos 248) and made three maneuvers in orbit changing the apogee or perigee. In the light of later tests, the second maneuver appears not to have created the prope geometry for the intercept operation. The third maneuver compounded this difficulty with the result that this intercept attempt was a failure. The distance at closest approach had not been reduced sufficiently for the interceptor to acquire the target; the relative velocity between the spacecraft was higher than that observed during successful intercepts; and the position for encounter was shifted to an area over the Mediterranean Sea, instead of to the area of the Soviet-Polish border where successful intercepts occurred later.

16. Twelve days after the first intercept attempt, a second interceptor, Cosmos 252, was placed into an orbit nearly identical to that of the first interceptor. Cosmos 252 apparently also made three maneuvers which produced the desired conditions for the encounter. The first and second maneuvers allowed the interceptor to catch up to the target and to achieve the correct geometry for the intercept shortly after the beginning of the interceptor's second orbit. The third maneuver reduced the distance at closest approach, increased the relative velocity between the spacecraft, and shifted the encounter position to an area northwest of Moscow.

17.

TABLE II

SOVIET ORBITAL SATELLITE INTERCEPT TESTS

	Cosmos[a] 248/249	Cosmos 248/252	Cosmos 373/374	Cosmos 373/375	Cosmos 394/397	Cosmos 400/404
Intercept Date	20 Oct 1968	1 Nov 1968	23 Oct 1970	30 Oct 1970	25 Feb 1971	4 April 1971
Launch Sites[a]	TT/TT	TT/TT	TT/TT	TT/TT	PL/TT	PL/TT
Launch Vehicles[a]	SL–11/SL–11	SL–11/SL–11	SL–11/SL–11	SL–11/SL–11	SL-8/SL-11	SL-8/SL-11
Orbital Phasing Technique	OTO[b]	OTO	OTO	OTO	OTO	ITO[b]
Intercept Sequence	I–T[c]	I–T	I–T	I–T	I–T	T-I[c]
Encounter Altitude (nm)	285	290	290	290	320	550
Encounter Location	South of France	Northwest of Moscow	West of Moscow	West of Moscow	West of Moscow	West of Moscow
Search Mode	—	—	Coning	Coning	Coning	Coning
Closest Distance (nm)[d]	73	0.9	3	1.1	1.4	14.6
Assessed Objective	R&D	R&D	R&D	R&D	R&D	R&D
Results	Failure	Success[e]	Probable Failure	Success[f]	Success[f]	Success[f]

[a] Target listed first, interceptor second.

[b] Outside the Target Orbit (OTO); Inside the Target Orbit (ITO).

[c] Interceptor towards Target (I-T); Target towards Interceptor (T-I).

[d] These are distances of closest approach calculated from available tracking data.

[e] If effect on target is criterion, event was a partial success.

[f] If effect on target is criterion, event was a failure.

18.

The Cosmos 373, 374, and 375 Test Series—October 1970

19. The second test series was, in many respects, similar to the first. The target, Cosmos 373, was launched by the SL-11 on 20 October 1970. A calibration satellite preceded its launch by five weeks. After achieving orbit, the target made three changes in orbit which put it in a position favorable for the launch of an interceptor.

20. The first of two interceptors, Cosmos 374, was launched three days later, and also made three maneuvers. The first one changed its orbital inclination—demonstrating for the first time an important type of mission flexibility. In addition to reducing the effects of possible operational difficulties, such as minor launch delays or imprecise launch vehicle performance, this ability to change plane enables the interceptor in certain circumstances to catch up with the target with the use of less propellant than might otherwise be required.

21. After its last maneuver, the interceptor began a coning motion not observed on previous tests, but seen on all of those that followed.

The target was unaffected by the intercept attempt.

The interceptor spacecraft was later fragmented as were the two interceptors used on the first test series. If the goal was also to intercept the target vehicle, as was probably the case, this test resulted in failure.

22. A second interceptor, Cosmos 375, was placed into orbit a week later and successfully made the three typical intercept maneuvers.

[redacted] Tracking data indicate that the closest approach was within about one mile. [redacted]

23. [redacted]

The Cosmos 394 and 397 Test—February 1971

24. In contrast to the two-year period which elapsed between the first and second test series, the next test was conducted only three and one-half months later. The target, Cosmos 394, was launched on 9 February 1971. It was noteworthy for several reasons:

— The target was launched by an SL-8 booster from Plesetsk, not an SL-11 from Tyuratam.

— [redacted]

— The orbit was different from that used by the earlier target vehicles, although it was also near-circular. It was at a higher altitude (320 miles instead of 285 miles). Its inclination was a few degrees higher (about 66 degrees instead of 62 degrees) than those of the earlier targets.

— The orbit of the target provided repeated launch opportunities for the interceptor, only on every fourth day, instead of every day.

— [redacted]

— It was a non-maneuvering satellite.

These features of the target tend to make this test more realistic than those conducted previously. Moreover, the short time which elapsed between the intercept tests suggest that the program had entered a more advanced phase.

25. The only interceptor in this test, Cosmos 397, was launched 16 days after the launch of the target. This was the fourth opportunity during which the target was in a favorable position for intercept. [redacted] Though its first orbit differed from the usual one, the interceptor successfully performed the three typical orbital intercept maneuvers.

26. After a period of search by coning, the interceptor [redacted] moved toward the target [redacted] A number of transverse maneuvers were made to close with the target. We do not know precisely how close the interceptor came to the target in this instance. Tracking data taken after the apparent closest

approach indicate the closest distance was within about 1.5 miles, but the actual distance probably was much smaller, as in the previous intercepts.

27. [

] The target, for the first time, showed no external effects of the intercept operation [

] In addition, no pieces were detected later in its orbit which was not perturbed. Its attitude stability was unchanged.

The Most Recent Test—Cosmos 400 and 404, March/April 1971

28. The most recent intercept test showed differences from all previous intercept tests. The target, Cosmos 400, was launched by an SL-8 booster from Plesetsk on 18 March. The orbit was significantly higher than before, but again was chosen so as to give recurring opportunities for launch of the interceptor. In this case, however, these opportunities occurred only once every 12 days. The orbit of Cosmos 400 was nearly circular (at 545 miles) but the inclination was kept at about 66 degrees.

29. The interceptor, Cosmos 404, was launched 16 days later from Tyuratam—the second opportunity provided by the target on a favorable pass over the interceptor launch site (the first opportunity having occurred the fourth day after target launch). Its first orbit was nearly identical to that of the interceptor used in the previous test, but one of the subsequent maneuvers differed from those in the previous tests in that it included a reversal of apogee and perigee. As a consequence, the encounter with the target in this test occurred near the apogee of the interceptor, rather than near its perigee as in the earlier tests. The intermediate orbits in this operation were different in yet another way. Previously, the interceptor went outside the orbit of the target to get in the proper position for encounter; in this instance the interceptor went inside the orbit of the target.

30. In all the previous tests, the interceptor overtook the target. Just prior to encounter, the interceptor would make its final orbital maneuver which increased the relative velocity between the spacecraft. In this operation, however, the target overtook the interceptor, and then the interceptor slowed itself. In this way, a closing velocity similar to that of earlier tests was achieved. Soviet insistence upon achieving this relative velocity suggests that it is a requirement of the interceptor's guidance system. After making the maneuver to slow itself, however, the interceptor no longer had sufficient velocity to remain in orbit.

31. [

] In this case, the limited tracking data available indicate that the closest distance between interceptor and target was within about 15 miles. Again, the distance was probably much smaller.

32. [

] The interceptor would have impacted in the northwest Pacific Ocean if it had survived re-entry. There was no evidence that recovery was intended. As a consequence of the deorbit we do not know whether the vehicle fragmented. Like the target of the earlier 1971 test, the target in this test showed no effects of the intercept operation.

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